CIRROSPILUS NEOTROPICUS SP. N. (HYMENOPTERA: EULOPHIDAE): AN INDIGENOUS BIOCONTROL AGENT OF THE CITRUS LEAFMINER, *PHYLLOCNISTIS CITRELLA* (LEPIDOPTERA: GRACILLARIIDAE) IN ARGENTINA[1]

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ABSTRACT: A complex of native parasitoids has been found to attack the citrus leafminer, *Phyllocnistis citrella* Stainton, since its introduction into Argentina. *Cirrospilus neotropicus* n. sp. is the most abundant indigenous parasitoid, with low but significant parasitism levels. *Cirrospilus neotropicus* n. sp. and the introduced exotic species, *Ageniaspis citricola* Logvinovskaya, are the main providers of biological control in the citrus orchards of northwestern Argentina. The new species, *C. neotropicus*, is described and the main morphological characters of both sexes are illustrated. Diagnostic characters are given which distinguish *C. neotropicus* from the Asiatic *C. ingenuus* Gahan, which has been mentioned in recent literature as similar to *C. neotropicus*, and from *C. floridensis* Evans, an eulophid recently described from Florida, USA.

KEY WORDS: *Cirrospilus neotropicus* n. sp., Hymenoptera, Eulophidae, biological control, Citrus Leafminer, *Phyllocnistis citrella*, Lepidoptera, Gracillariidae

After the introduction of the citrus leafminer (CLM) into Argentina in 1996, some six species of parasitoids were commonly recorded as attacking this pest: *Elachertus* sp., *Closterocerus* sp., *Cirrospilus* sp., *Sympiesis* sp., *Galeopsomyia fausta* La Salle and *Elasmus* sp. (Eulophidae) (Frías and Diez, 1997; La Salle and Peña, 1998; Schauff et al., 1998; Fernández et al., 1999a). One year later (1997), *Ageniaspis citricola* Logvinoskaya (Encyrtidae) was discovered in Tucumán province: a case of ecesis in biological control (Diez et al., 2000; Fernandez et al., 1999b). Nevertheless, in 1998 this parasitoid was introduced again into citrus orchards in Tucumán using stock obtained in Peru (Figueroa et al., 1999). The performance of the above mentioned parasitoids was evaluated by Diez et al. (2000) and Diez (2001) who observed that *A. citricola* is the most important biological control agent of the pest with a high level of parasitism (54%); followed by a single native parasitoid *Cirrospilus* sp. (19%). The other parasitoids are very uncommon and only occasionally are reared from the CLM. The species of *Cirrospilus* obtained from the CLM in Argentina has a wide distribution in the Neotropical region, from Mexico to Argentina, and was recorded in the literature, as "*Cirrospilus* sp. C", from Argentina, Brazil, Colombia, Honduras and Mexico (Schauff et al., 1998). Bautista *et al.* (1996) mentioned this species as "*C. cuadristriatus*" and Perales et al. (1996a, 1996b) as "*C. quadristriatus [=C. ingenuus]*" but Schauff et al. (1998) considered it to be an undescribed species and designated it as "*Cirrospilus* sp. C." The paper by

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Schauff et al. (1998) has facilitated enormously the identification of natural enemies of the CLM in all parts of the world where it is present. We describe this important indigenous CLM parasitoid as a new species in order to facilitate its recognition and permit its evaluation. The morphological terms used here follow Gibson (1997).

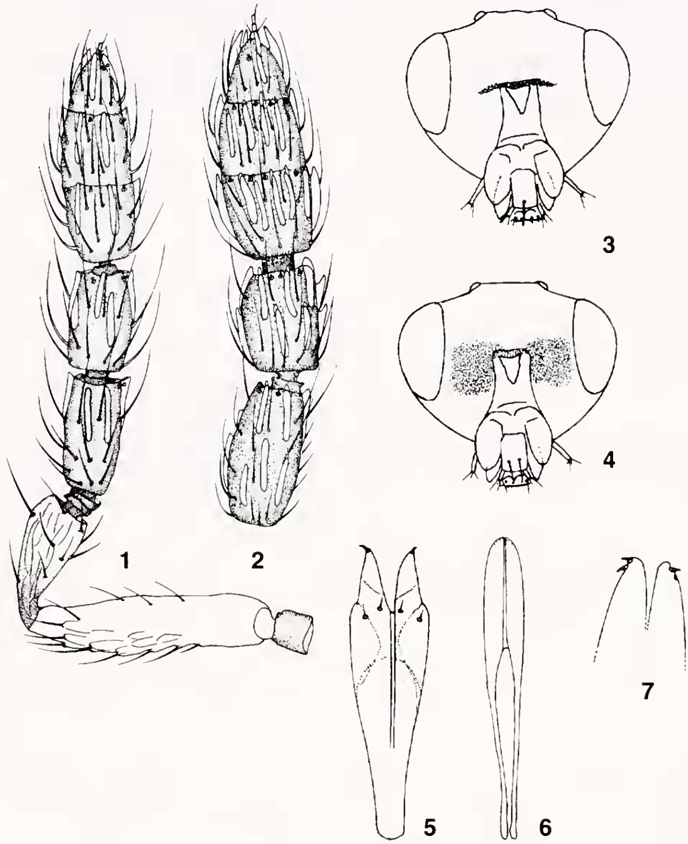
Cirrospilus neotropicus Diez and Fidalgo, NEW SPECIES
(Figs. 1-3, 5-6, 8, 10-12)

Cirrospilus sp. C, Schauff et al., 1998: 1011.
Bautista el al., 1996:73 as *C. Cuadristriatus*.
Perales et al., 1996a: 93 - 1996b: 349-350, as *C. quadristriatus*.

Description. Female holotype: **Coloration** (Figs. 2, 3, 11). Body yellow with the following areas dark brown: radicle and antennal flagellum (basal half of pedicel dark but lighter than flagellum), apex of mandible, transverse line above occipital foramen (Fig. 3), small spot on neck of pronotum, small spot around mesothoracic spiracle, notauli, transcutal articulation, small spot laterally on metanotum, dorsal setae of prothorax and mesothorax, posterior margin of propleuron, small spot on upper mesepimeron, basal half of petiole, two lateral spots on first tergite of gaster, a transverse band located at the posterior margin of tergite 2nd and anterior margin of 3rd, another similar band in 3rd-4th tergites, 4th-5th tergites and 5th-6th tergites (last band curving backwards laterally), and third valvulae (Fig. 11). Wings hyaline except venation and setae dark brown, parastigma with a hyaline break. **Structure.** Body length: 1.68 mm; all parts of body with shallow more or less hexagonal reticulation. **Head:** antenna attached at level of lower margin of eye, radicle short (about as long as wide), scape 4x as long as wide in lateral or dorsal view, first funicular segment about as long as pedicel and a little longer than the second, clava with a terminal spine; all funicular segments and clava with longitudinal sensilla, some of them, particularly on the apical segments, with their apices projecting freely above surface (Fig. 2); mushroom-shaped capitate peg sensilla present apically between longitudinal sensilla on all funicular segments and on first and second segments of clava, a single one sensillum on the last segment of clava (Fig. 2); maxillary and labial palpi one segmented, labium with one seta (Fig. 3); mandible with 2 external large and 4 internal small teeth; malar sulcus present (lineal); compound eyes with hairs between facets. **Mesosoma:** prosternum closed by cervicalia; prepectus subtriangular in shape; anterior third of notauli converging posteriorly, but becoming almost parallel in the posterior two thirds; placoid sensilla of scutellum small and round, located about halfway between anterior and posterior pairs of setae; propodeum with a prominent medial carina and plicae along anterior and posterior margins (also with small carinae laterally), callus with 9-10 setae; endophragma apically notched, its end at the level of posterior margin of propodeum. Hind coxae vague on outer side. **Fore wing:** length 2.2x its maximum width; submarginal vein 0.8x length of marginal vein; stigmal vein 0.2x length of marginal vein, stigma extending beyond base of uncus (~ 2 uncus-lengths), uncus distinctly recurved (Fig. 8); postmarginal vein 0.8x length of stigmal vein (Fig. 8); parastigma with paired sensilla in the hyaline break, costal cell with more setae on the distal upper margin than in the ventral surface, marginal fringe short, less than 0.1x maximum width of fore wing. **Metasoma:** petiole small, 0.3x as long as broad, smooth and conical in shape, ovipositor length 1.7x length of hind tibia.

Male. Body length: 0.7-1.25 mm. Similar to female in structure and coloration (Fig. 1, 3, 10), except antennal flagellum with fewer longitudinal sensilla, whose apices do not project freely above the surface (Fig. 1), and in 45 of specimens there is a dark brown central spot on the scutellum and the axilla (Fig. 12). Genitalia as in figures 5 and 6; aedeagus length 1.1x length of genital capsule; apex of digitus sharp-pointed and with one digital spine (Fig. 5).

Morphological variation. Males vary primarily in the degree of coloration of the mesosoma: 6.2% of the specimens lack the central spot on the scutellum and one specimen has three spots on the propodeum. Both females and males some-

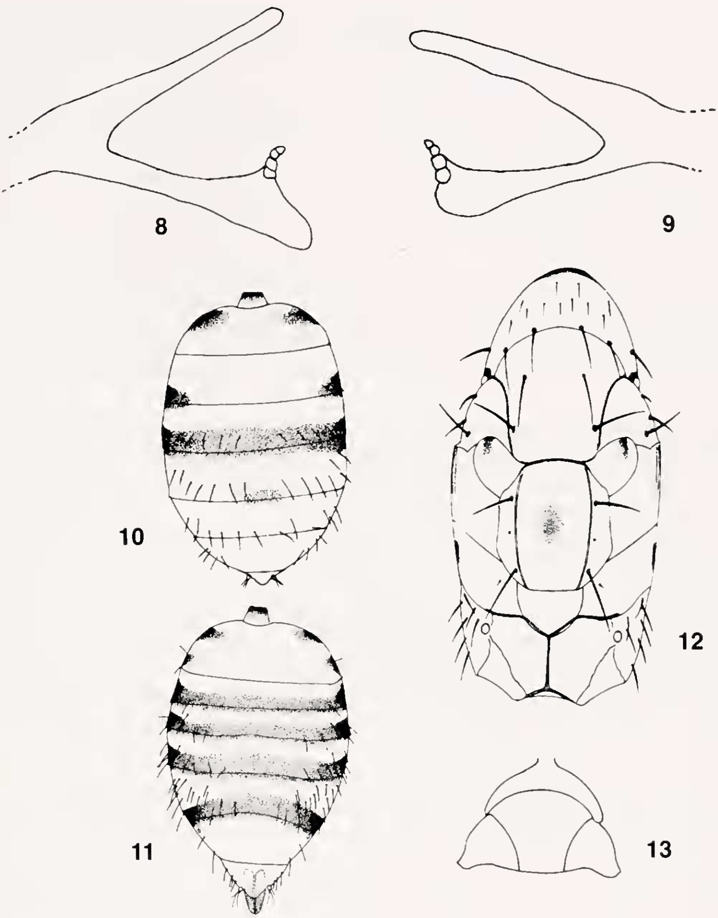


Figs. 1-7. *Cirrospilus neotropicus* **n. sp.** (1, 2, 3, 5, and 6), *Cirrospilus ingenuus* Gahan (4, 7). **1** antenna ♂; **2** flagellum ♀; **3** head in posterior view; **4** head in posterior view; **5** aedeagus; **6** genital capsule; **7** digitus.

times have the anterior, median and posterior carinae of the propodeum light brown rather than dark brown. Females and males also vary in the number of setae on the midlobe of the mesoscutum.

Type material of *C. neotropicus* n. sp. is deposited in the Collections of: **IMLA** Instituto Miguel Lillo, Tucumán, Argentina: ♀ Holotype and 15 ♀ and 12 ♂ Paratypes; **MCNLP** Museo de Ciencias Naturales de La Plata, Argentina: 1 ♀ and 1 ♂ Paratypes; **USNM** United States National Museum, Washington, DC: 1 ♀ and 1 ♂ Paratypes; **FSCA** Florida State Collections of Arthropods, Gainesville, Florida, USA: 1 ♀ and 1 ♂ Paratypes; **BMNH** British Museum of Natural History, London: 1 ♀ and 1 ♂ Paratypes.

Specimens studied. All specimens were reared from *Phyllocnistis citrella* on citrus. Holotype female, **Argentina:** TUCUMÁN: Horco Molle, 1-1-2000, P. Diez and E. Frías coll.; Paratypes:



Figs. 8-13. *Cirrospilus neotropicus* **n. sp.** (8, 10 - 12), *Cirrospilus ingenuus* Gahan (9, 13). **8** postmarginal and stigmal veins; **9** postmarginal and stigmal veins; **10** gaster mm; **11** gaster ff; **12** thorax ff; **13** anterior half of thorax showing notauli.

TUCUMÁN: Horco Molle, 1-II-2000, P. Diez and E. Frías coll. (1 ♂). CATAMARCA: Villa Capayán (ca. Concepción), 4-II-2000, O. Luque col. (5 ♀ y 6 ♂); Colonia del Valle, 4-II-2000, O. Luque col. (8 ♀ y 3 ♂); 26-II-2003, O. Luque col. (7 ♀ y 7 ♂).

Distribution. Neotropical, from Mexico to Argentina (Schauff et al., 1998): México, Honduras, Colombia, Brasil, Argentina, and Bolivia (new record). In Argentina it is present in the provinces of Salta (Los Tucanes, Ruta Nacional 34, km. 1,286), JUJUY (Finca Lucero, ca. Ledesma; Yuto), TUCUMÁN (Horco Molle, S. M. de Tucumán, Tafí Viejo), CHACO (Makallé), SANTA FE (Villa Ocampo) and CATAMARCA (Colonia del Valle, Villa Capayán).

Etymology. This species is named for the Neotropical region where *C. neotropicus* n. sp is widely present.

Remarks. According to Schauff et al. (1998) "this species is very similar in coloration to *C. ingenuus* Gahan, but is distinct on morphological characters." *C. ingenuus* is native to Asia and was introduced in Florida (USA) where it is apparently established (La Salle et al., 1999). Recently Evans (1999) described *C. floridensis* reared from CLM in Florida so there are at present three known species of *Cirrospilus* attacking CLM in the New World. After studying five specimens (3 ♀ and 2 ♂) of *C. ingenuus* from USA (Florida, Homestead, 26-vii-2000, P. Diez col., Ex *P. citrella* on citrus) and based on the Gahan (1932) description and on Evans' description of *C. floridensis,* we observed the following differences in these species which we present in the following key:

1 Notauli converging distinctly posteriorly as they reach hind margin of mesoscutum (Fig. 13); propodeum very coarsely sculptured, (as the hind coxae on the outer side), with a delicate median carina but without lateral folds; stigma not extending much beyond base of uncus; uncus only slightly recurved; postmarginal vein 1.2x longer than the stigmal vein; male genitalia with the apex of the digitus rounded and with two digital spines (Fig. 7); dark spot (sunglasses-shaped spot) around occipital foramen (Fig. 4) .... *Cirrospilus ingenuus* Gahan

• Notauli converging posteriorly in it first third, but becoming almost parallel as they reach hind margin of mesoscutum (Fig. 12); propodeum with a prominent median carina (smooth on anterior half and with minute carinae on the posterior half), hind coxae with shallow sculpture; stigma extending beyond base of uncus (~ 2 uncus-lengths), uncus distinctly recurved; postmarginal vein always shorter than stigmal vein; male genitalia with the apex of digitus sharp and with one digital spine (unknown in *C. floridensis*) (Fig. 5); dark spot around occipital foramen absent, only a line dorsal (Fig. 3) 2

2 Female: first tergite of gaster with two dark spots on each lateral margin. Male: gaster with two dark transverse bands medially on dorsum. Both mesoscutum with a dark band along anterior and posterior margin .... *Cirrospilus floridensis* Evans

• Female: first tergite of gaster with one dark spot on each lateral margin (Fig. 10). Male: gaster with one dark tranverse band medially on dorsum (Fig. 10); both: mesoscutum without dark bands .... *Cirrospilus neotropicus* Diez and Fidalgo

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